

Response to Anonymous Referee#2 (gmd-2016-28)

#####

It is my understanding that examples of model output should be provided, with evaluation against standard benchmarks, observations in GMD. There appears to be no reason to divide the model description paper to two papers because both the model description part (this paper) and the validation part (another submitted paper) are not so long. However, if dividing the study into two papers is acceptable, I think this paper is acceptable.

#####

Although the present paper does not include the model parameterization and validation, the journal guideline admits the separate submission of model description and evaluation papers, if the evaluation is extensive. The revised version of the evaluation paper will become more extensive, because we will add the results of two types of simulations into the revised manuscript of the evaluation paper: the effects of model modifications and the validation of the model at the sites which are independent from the parameterization site. Considering the extent of the model evaluation paper, we think the separate submission is acceptable.

#####

p. 5, l. 11: Is this assumption appropriate? The model that the authors are developing is rice specific model. However, the leaf orientation of most Poaceae species would not be random. The required preciseness for the leaf orientation may depend on the purpose of the model (or temporal resolution), but the precise description of the leaf orientation may be needed if the purpose of the model is the estimation of hourly fluctuation of the fluxes. If the purpose of the model is the estimation of crop yield for example, the assumption of the leaf orientation may not have critical effect on the estimation. The authors should add the discussion of the appropriateness of the assumption.

#####

To be precise, this assumption is not appropriate. The leaf orientation of crops varies with their growing. However, no data is available on the change in the leaf

orientation for rice. Therefore, we assumed that it is random. As you pointed out, the required accuracy depends on the purpose of the model. In the revised manuscript of the evaluation paper, we will add the results of the comparison of hourly fluxes between simulations and observations. The results showed that the simulations are in good agreement with the observations for the hourly fluxes.

We will add the above discussion into the revised manuscript.

#####

p. 6, l. 19-20: Please explain in detail.

#####

The equation of the scattered factor, $df = \sec(2\pi * (53/360))$, is related to the third assumption in the previous page (P5). The detail of the assumption was explained at P5 L14-15 in the manuscript. To make clear the relation between the equation and assumption, we will add the above explanation in the revised manuscript.

#####

p. 11, l. 28: The down-regulation effect of photosynthesis has a very profound effect on crop growth. The parameters relevant to photosynthesis down-regulation in Arora et al. (2009) are calculated using mainly plants other than rice. Therefore, the authors should explain the applicability of the parameter values to rice.

#####

We think the down-regulation effect is limited under the current CO2 concentration, but significant under the future. In the manuscript, we “tentatively” used the mean value for the key parameter in the equation of down-regulation in Arora et al. (2009), because there is no information on the key parameter of the equation for rice, according to our knowledge, and the CO2 effect on crop growth still has a large uncertainty. If the value for the key parameter is quantified in the future, the tentative value should be replaced. We will add the above discussion into the revised manuscript.

#####

Eq. 69-71: Please change the variable name of "Q_t". The character "Q" is already used for the photon flux density.

#####

We will change the symbol in the revised manuscript.

#####

All equations: Italic should be used for only scalars in principle. For example, it may be preferable not to use Italic for the subscript "c" of "H_c" if "c" is not scalar value. Moreover, upright font (not italic) should be used for multi-letter variables (for example, "R_{nc}"). Please recheck almost of all subscripts and superscripts of the equations.

#####

According to your comments, we will recheck and modify the symbols for variables and parameters.